

autogluon_each_location

October 9, 2023

```
[1]: # config

label = 'y'
metric = 'mean_absolute_error'
time_limit = 60*30
presets = 'best_quality'

do_drop_ds = True
# hour, dayofweek, dayofmonth, month, year
use_dt_attrs = [] # "hour", "dayofweek", "day", "month", "year"
use_estimated_diff_attr = False
use_is_estimated_attr = True

use_groups = False
n_groups = 8

auto_stack = False
num_stack_levels = 3
num_bag_folds = 8
if auto_stack:
    num_stack_levels = None
    num_bag_folds = None

use_tune_data = False
use_test_data = True
tune_and_test_length = 24*30*3 # 3 months from end, this changes the
    ↪ evaluations for only test
holdout_frac = None
use_bag_holdout = False # Enable this if there is a large gap between score_val
    ↪ and score_test in stack models.

sample_weight = None # 'sample_weight' # None
weight_evaluation = False # True # False
sample_weight_estimated = 1 # this changes evaluations for test and tune WTF,
    ↪ cant find a fix

run_analysis = False
```

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[2]: import pandas as pd
import numpy as np

import warnings
warnings.filterwarnings("ignore")

def fix_datetime(X, name):
    # Convert 'date_forecast' to datetime format and replace original column
    ↪with 'ds'
    X['ds'] = pd.to_datetime(X['date_forecast'])
    X.drop(columns=['date_forecast'], inplace=True, errors='ignore')
    X.sort_values(by='ds', inplace=True)
    X.set_index('ds', inplace=True)

    # Drop rows where the minute part of the time is not 0
    X = X[X.index.minute == 0].copy()
    return X

def convert_to_datetime(X_train_observed, X_train_estimated, X_test, y_train):
    X_train_observed = fix_datetime(X_train_observed, "X_train_observed")
    X_train_estimated = fix_datetime(X_train_estimated, "X_train_estimated")
    X_test = fix_datetime(X_test, "X_test")

    # add sample weights, which are 1 for observed and 3 for estimated
    X_train_observed["sample_weight"] = 1
    X_train_estimated["sample_weight"] = sample_weight_estimated
    X_test["sample_weight"] = sample_weight_estimated

    if use_estimated_diff_attr:
        X_train_observed["estimated_diff_hours"] = 0
        X_train_estimated["estimated_diff_hours"] = (X_train_estimated.index -
        ↪pd.to_datetime(X_train_estimated["date_calc"])).dt.total_seconds() / 3600
        X_test["estimated_diff_hours"] = (X_test.index - pd.
        ↪to_datetime(X_test["date_calc"])).dt.total_seconds() / 3600

        X_train_estimated["estimated_diff_hours"] =
        ↪X_train_estimated["estimated_diff_hours"].astype('int64')
        # the filled once will get dropped later anyways, when we drop y nans
        X_test["estimated_diff_hours"] = X_test["estimated_diff_hours"].
        ↪fillna(-50).astype('int64')

    if use_is_estimated_attr:
        X_train_observed["is_estimated"] = 0

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X_train_estimated["is_estimated"] = 1
X_test["is_estimated"] = 1

X_train_estimated.drop(columns=['date_calc'], inplace=True)
X_test.drop(columns=['date_calc'], inplace=True)

y_train['ds'] = pd.to_datetime(y_train['time'])
y_train.drop(columns=['time'], inplace=True)
y_train.sort_values(by='ds', inplace=True)
y_train.set_index('ds', inplace=True)

return X_train_observed, X_train_estimated, X_test, y_train

def preprocess_data(X_train_observed, X_train_estimated, X_test, y_train,
↳location):
    # convert to datetime
    X_train_observed, X_train_estimated, X_test, y_train =
↳convert_to_datetime(X_train_observed, X_train_estimated, X_test, y_train)

    y_train["y"] = y_train["pv_measurement"].astype('float64')
    y_train.drop(columns=['pv_measurement'], inplace=True)
    X_train = pd.concat([X_train_observed, X_train_estimated])

    # fill missng sample_weight with 3
    #X_train["sample_weight"] = X_train["sample_weight"].fillna(0)

    # clip all y values to 0 if negative
    y_train["y"] = y_train["y"].clip(lower=0)

    X_train = pd.merge(X_train, y_train, how="inner", left_index=True,
↳right_index=True)

    # print number of nans in sample_weight
    print(f"Number of nans in sample_weight: {X_train['sample_weight'].isna().
↳sum()}")

    # print number of nans in y
    print(f"Number of nans in y: {X_train['y'].isna().sum()}")

    X_train["location"] = location
    X_test["location"] = location

```

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    return X_train, X_test
# Define locations
locations = ['A', 'B', 'C']

X_trains = []
X_tests = []
# Loop through locations
for loc in locations:
    print(f"Processing location {loc}...")
    # Read target training data
    y_train = pd.read_parquet(f'{loc}/train_targets.parquet')

    # Read estimated training data and add location feature
    X_train_estimated = pd.read_parquet(f'{loc}/X_train_estimated.parquet')

    # Read observed training data and add location feature
    X_train_observed = pd.read_parquet(f'{loc}/X_train_observed.parquet')

    # Read estimated test data and add location feature
    X_test_estimated = pd.read_parquet(f'{loc}/X_test_estimated.parquet')

    # Preprocess data
    X_train, X_test = preprocess_data(X_train_observed, X_train_estimated,
    ↪X_test_estimated, y_train, loc)

    X_trains.append(X_train)
    X_tests.append(X_test)

# Concatenate all data and save to csv
X_train = pd.concat(X_trains)
X_test = pd.concat(X_tests)

```

```

Processing location A...
Number of nans in sample_weight: 0
Number of nans in y: 0
Processing location B...
Number of nans in sample_weight: 0
Number of nans in y: 4
Processing location C...
Number of nans in sample_weight: 0
Number of nans in y: 6059

```

1 Feature engineering

```
[3]: import numpy as np
import pandas as pd

X_train.dropna(subset=['y'], inplace=True)

for attr in use_dt_attrs:
    X_train[attr] = getattr(X_train.index, attr)
    X_test[attr] = getattr(X_test.index, attr)

print(X_train.head())

if use_groups:
    # fix groups for cross validation
    locations = X_train['location'].unique() # Assuming 'location' is the name
    ↪ of the column representing locations

    grouped_dfs = [] # To store data frames split by location

    # Loop through each unique location
    for loc in locations:
        loc_df = X_train[X_train['location'] == loc]

        # Sort the DataFrame for this location by the time column
        loc_df = loc_df.sort_index()

        # Calculate the size of each group for this location
        group_size = len(loc_df) // n_groups

        # Create a new 'group' column for this location
        loc_df['group'] = np.repeat(range(n_groups),
    ↪ repeats=[group_size]*(n_groups-1) + [len(loc_df) - group_size*(n_groups-1)])

        # Append to list of grouped DataFrames
        grouped_dfs.append(loc_df)

    # Concatenate all the grouped DataFrames back together
    X_train = pd.concat(grouped_dfs)
    X_train.sort_index(inplace=True)
    print(X_train["group"].head())
```

```
to_drop = ["snow_drift:idx", "snow_density:kgm3"]
```

```
X_train.drop(columns=to_drop, inplace=True)
```

```
X_test.drop(columns=to_drop, inplace=True)
```

```
X_train.to_csv('X_train_raw.csv', index=True)
```

```
X_test.to_csv('X_test_raw.csv', index=True)
```

```

                                absolute_humidity_2m:gm3  air_density_2m:kgm3  \
ds
2019-06-02 22:00:00                                7.7                1.230
2019-06-02 23:00:00                                7.7                1.225
2019-06-03 00:00:00                                7.7                1.221
2019-06-03 01:00:00                                8.2                1.218
2019-06-03 02:00:00                                8.8                1.219

```

```

                                ceiling_height_agl:m  clear_sky_energy_1h:J  \
ds
2019-06-02 22:00:00                1744.900024                0.000000
2019-06-02 23:00:00                1703.599976                0.000000
2019-06-03 00:00:00                1668.099976                0.000000
2019-06-03 01:00:00                1388.400024                0.000000
2019-06-03 02:00:00                1108.500000                6546.899902

```

```

                                clear_sky_rad:W  cloud_base_agl:m  dew_or_rime:idx  \
ds
2019-06-02 22:00:00                0.0                1744.900024                0.0
2019-06-02 23:00:00                0.0                1703.599976                0.0
2019-06-03 00:00:00                0.0                1668.099976                0.0
2019-06-03 01:00:00                0.0                1388.400024                0.0
2019-06-03 02:00:00                9.8                1108.500000                0.0

```

```

                                dew_point_2m:K  diffuse_rad:W  diffuse_rad_1h:J  ...  \
ds
2019-06-02 22:00:00                280.299988                0.0                0.000000  ...
2019-06-02 23:00:00                280.299988                0.0                0.000000  ...
2019-06-03 00:00:00                280.200012                0.0                0.000000  ...
2019-06-03 01:00:00                281.299988                0.0                0.000000  ...
2019-06-03 02:00:00                282.299988                4.3                7743.299805  ...

```

```

                                total_cloud_cover:p  visibility:m  wind_speed_10m:ms  \
ds
2019-06-02 22:00:00                100.0  39640.101562                3.7
2019-06-02 23:00:00                100.0  41699.898438                3.5
2019-06-03 00:00:00                100.0  20473.000000                3.2

```

2019-06-03 01:00:00	100.0	2104.600098	2.8
2019-06-03 02:00:00	100.0	2681.600098	2.7

	wind_speed_u_10m:ms	wind_speed_v_10m:ms	\
ds			
2019-06-02 22:00:00	-3.6	-0.8	
2019-06-02 23:00:00	-3.5	0.0	
2019-06-03 00:00:00	-3.1	0.7	
2019-06-03 01:00:00	-2.7	0.8	
2019-06-03 02:00:00	-2.5	1.0	

	wind_speed_w_1000hPa:ms	sample_weight	is_estimated	\
ds				
2019-06-02 22:00:00	-0.0	1	0	
2019-06-02 23:00:00	-0.0	1	0	
2019-06-03 00:00:00	-0.0	1	0	
2019-06-03 01:00:00	-0.0	1	0	
2019-06-03 02:00:00	-0.0	1	0	

	y	location
ds		
2019-06-02 22:00:00	0.00	A
2019-06-02 23:00:00	0.00	A
2019-06-03 00:00:00	0.00	A
2019-06-03 01:00:00	0.00	A
2019-06-03 02:00:00	19.36	A

[5 rows x 49 columns]

```
[4]: from autogluon.tabular import TabularDataset, TabularPredictor
from autogluon.timeseries import TimeSeriesDataFrame
import numpy as np
train_data = TabularDataset('X_train_raw.csv')
# set group column of train_data be increasing from 0 to 7 based on time, the
# first 1/8 of the data is group 0, the second 1/8 of the data is group 1, etc.
train_data['ds'] = pd.to_datetime(train_data['ds'])
train_data = train_data.sort_values(by='ds')

# # print size of the group for each location
# for loc in locations:
#     print(f"Location {loc}:")
#     print(train_data[train_data["location"] == loc].groupby('group').size())

# get end date of train data and subtract 3 months
split_time = pd.to_datetime(train_data["ds"]).max() - pd.
    Timedelta(hours=tune_and_test_length)
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train_set = TabularDataset(train_data[train_data["ds"] < split_time])
test_set = TabularDataset(train_data[train_data["ds"] >= split_time])
if use_groups:
    test_set = test_set.drop(columns=['group'])

if do_drop_ds:
    train_set = train_set.drop(columns=['ds'])
    test_set = test_set.drop(columns=['ds'])
    train_data = train_data.drop(columns=['ds'])

def normalize_sample_weights_per_location(df):
    for loc in locations:
        loc_df = df[df["location"] == loc]
        loc_df["sample_weight"] = loc_df["sample_weight"] /
        loc_df["sample_weight"].sum() * loc_df.shape[0]
        df[df["location"] == loc] = loc_df
    return df

tuning_data = None
if use_tune_data:
    train_data = train_set
    if use_test_data:
        # split test_set in half, use first half for tuning
        tuning_data, test_data = [], []
        for loc in locations:
            loc_test_set = test_set[test_set["location"] == loc]
            loc_tuning_data = loc_test_set.iloc[:len(loc_test_set)//2]
            loc_test_data = loc_test_set.iloc[len(loc_test_set)//2:]
            tuning_data.append(loc_tuning_data)
            test_data.append(loc_test_data)
        tuning_data = pd.concat(tuning_data)
        test_data = pd.concat(test_data)
        print("Shapes of tuning and test", tuning_data.shape[0], test_data.
        shape[0], tuning_data.shape[0] + test_data.shape[0])

    else:
        tuning_data = test_set
        print("Shape of tuning", tuning_data.shape[0])

        # ensure sample weights for your tuning data sum to the number of rows in
        the tuning data.
        tuning_data = normalize_sample_weights_per_location(tuning_data)

else:
    if use_test_data:

```



```

train_data = train_set
test_data = test_set
print("Shape of test", test_data.shape[0])

# ensure sample weights for your training (or tuning) data sum to the number of
# rows in the training (or tuning) data.
train_data = normalize_sample_weights_per_location(train_data)
if use_test_data:
    test_data = normalize_sample_weights_per_location(test_data)

```

Shape of test 5791

```

[5]: if run_analysis:
    import autogluon.eda.auto as auto
    auto.dataset_overview(train_data=train_data, test_data=test_data,
    label="y", sample=None)

```

```

[6]: if run_analysis:
    auto.target_analysis(train_data=train_data, label="y")

```

2 Starting

```

[7]: import os

# Get the last submission number
last_submission_number = int(max([int(filename.split('_')[1].split('.')[0]) for
# filename in os.listdir('submissions') if "submission" in filename]))
print("Last submission number:", last_submission_number)
print("Now creating submission number:", last_submission_number + 1)

# Create the new filename
new_filename = f'submission_{last_submission_number + 1}'

hello = os.environ.get('HELLO')
if hello is not None:
    new_filename += f'_{hello}'

print("New filename:", new_filename)

```

Last submission number: 86
 Now creating submission number: 87
 New filename: submission_87

```

[8]: predictors = [None, None, None]

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```

[9]: def fit_predictor_for_location(loc):
    print(f"Training model for location {loc}...")
    # sum of sample weights for this location, and number of rows, for both
    ↪train and tune data and test data
    print("Train data sample weight sum:", train_data[train_data["location"] ==
    ↪loc]["sample_weight"].sum())
    print("Train data number of rows:", train_data[train_data["location"] ==
    ↪loc].shape[0])
    if use_tune_data:
        print("Tune data sample weight sum:",
    ↪tuning_data[tuning_data["location"] == loc]["sample_weight"].sum())
        print("Tune data number of rows:", tuning_data[tuning_data["location"]
    ↪== loc].shape[0])
    if use_test_data:
        print("Test data sample weight sum:", test_data[test_data["location"]
    ↪== loc]["sample_weight"].sum())
        print("Test data number of rows:", test_data[test_data["location"] ==
    ↪loc].shape[0])
    predictor = TabularPredictor(
        label=label,
        eval_metric=metric,
        path=f"AutogluonModels/{new_filename}_{loc}",
        sample_weight=sample_weight,
        weight_evaluation=weight_evaluation,
        groups="group" if use_groups else None,
    ).fit(
        train_data=train_data[train_data["location"] == loc],
        time_limit=time_limit,
        #presets=presets,
        num_stack_levels=num_stack_levels,
        num_bag_folds=num_bag_folds if not use_groups else 2, # just put
    ↪somethin, will be overwritten anyways
        tuning_data=tuning_data[tuning_data["location"] == loc] if
    ↪use_tune_data else None,
        use_bag_holdout=use_bag_holdout,
        holdout_frac=holdout_frac,
    )

    # evaluate on test data
    if use_test_data:
        # drop sample_weight column
        t = test_data[test_data["location"] == loc]#.
    ↪drop(columns=["sample_weight"])
        perf = predictor.evaluate(t)
        print("Evaluation on test data:")
        print(perf[predictor.eval_metric.name])

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    return predictor

loc = "A"
predictors[0] = fit_predictor_for_location(loc)

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Warning: path already exists! This predictor may overwrite an existing
predictor! path="AutogluonModels/submission_87_A"
Beginning AutoGluon training ... Time limit = 1800s
AutoGluon will save models to "AutogluonModels/submission_87_A/"
AutoGluon Version: 0.8.2
Python Version: 3.10.12
Operating System: Linux
Platform Machine: x86_64
Platform Version: #1 SMP Debian 5.10.197-1 (2023-09-29)
Disk Space Avail: 302.55 GB / 315.93 GB (95.8%)
Train Data Rows: 31900
Train Data Columns: 46
Label Column: y
Preprocessing data ...

Training model for location A...
Train data sample weight sum: 31900
Train data number of rows: 31900
Test data sample weight sum: 2161
Test data number of rows: 2161

AutoGluon infers your prediction problem is: 'regression' (because dtype of
label-column == float and many unique label-values observed).
    Label info (max, min, mean, stddev): (5733.42, 0.0, 633.132, 1165.64686)
    If 'regression' is not the correct problem_type, please manually specify
the problem_type parameter during predictor init (You may specify problem_type
as one of: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
    Available Memory: 132460.7 MB
    Train Data (Original) Memory Usage: 13.33 MB (0.0% of available memory)
    Inferring data type of each feature based on column values. Set
feature_metadata_in to manually specify special dtypes of the features.
    Stage 1 Generators:
        Fitting AsTypeFeatureGenerator...
            Note: Converting 4 features to boolean dtype as they
only contain 2 unique values.
    Stage 2 Generators:
        Fitting FillNaFeatureGenerator...
    Stage 3 Generators:
        Fitting IdentityFeatureGenerator...
    Stage 4 Generators:
        Fitting DropUniqueFeatureGenerator...

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Stage 5 Generators:
    Fitting DropDuplicatesFeatureGenerator...
    Useless Original Features (Count: 3): ['elevation:m', 'sample_weight',
'location']
        These features carry no predictive signal and should be manually
investigated.
        This is typically a feature which has the same value for all
rows.
        These features do not need to be present at inference time.
    Types of features in original data (raw dtype, special dtypes):
        ('float', []) : 42 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', ...]
        ('int', []) : 1 | ['is_estimated']
    Types of features in processed data (raw dtype, special dtypes):
        ('float', []) : 39 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', ...]
        ('int', ['bool']) : 4 | ['is_day:idx', 'is_in_shadow:idx',
'wind_speed_w_1000hPa:ms', 'is_estimated']
    0.2s = Fit runtime
    43 features in original data used to generate 43 features in processed
data.
    Train Data (Processed) Memory Usage: 10.08 MB (0.0% of available memory)
    Data preprocessing and feature engineering runtime = 0.22s ...
    AutoGluon will gauge predictive performance using evaluation metric:
'mean_absolute_error'
        This metric's sign has been flipped to adhere to being higher_is_better.
The metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
    User-specified model hyperparameters to be fit:
{
    'NN_TORCH': {},
    'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}],
'GBMLarge'],
    'CAT': {},
    'XGB': {},
    'FASTAI': {},
    'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],
    'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],

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```

'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}},
{'weights': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
AutoGluon will fit 4 stack levels (L1 to L4) ...
Fitting 11 L1 models ...
Fitting model: KNeighborsUnif_BAG_L1 ... Training model for up to 599.77s of the
1799.77s of remaining time.
    -299.6339      = Validation score    (-mean_absolute_error)
    0.04s      = Training    runtime
    0.4s      = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 ... Training model for up to 599.26s of the
1799.25s of remaining time.
    -300.6895      = Validation score    (-mean_absolute_error)
    0.04s      = Training    runtime
    0.4s      = Validation runtime
Fitting model: LightGBMXT_BAG_L1 ... Training model for up to 598.77s of the
1798.77s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -174.1111      = Validation score    (-mean_absolute_error)
    31.28s      = Training    runtime
    12.66s      = Validation runtime
Fitting model: LightGBM_BAG_L1 ... Training model for up to 559.48s of the
1759.48s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -179.844      = Validation score    (-mean_absolute_error)
    30.26s      = Training    runtime
    7.54s      = Validation runtime
Fitting model: RandomForestMSE_BAG_L1 ... Training model for up to 526.71s of
the 1726.7s of remaining time.
    -192.1045      = Validation score    (-mean_absolute_error)
    8.18s      = Training    runtime
    1.19s      = Validation runtime
Fitting model: CatBoost_BAG_L1 ... Training model for up to 516.71s of the
1716.71s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -185.8683      = Validation score    (-mean_absolute_error)
    202.61s      = Training    runtime
    0.09s      = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L1 ... Training model for up to 313.04s of the
1513.04s of remaining time.
    -191.928      = Validation score    (-mean_absolute_error)
    1.86s      = Training    runtime
    1.19s      = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 ... Training model for up to 309.35s of
the 1509.35s of remaining time.

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    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -196.7164      = Validation score    (-mean_absolute_error)
    38.74s       = Training   runtime
    0.52s       = Validation runtime
Fitting model: XGBoost_BAG_L1 ... Training model for up to 269.51s of the
1469.51s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -189.9447      = Validation score    (-mean_absolute_error)
    9.51s        = Training   runtime
    0.4s         = Validation runtime
Fitting model: NeuralNetTorch_BAG_L1 ... Training model for up to 258.17s of the
1458.16s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -180.7681      = Validation score    (-mean_absolute_error)
    113.22s       = Training   runtime
    0.4s         = Validation runtime
Fitting model: LightGBMLarge_BAG_L1 ... Training model for up to 143.73s of the
1343.73s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -174.2225      = Validation score    (-mean_absolute_error)
    107.45s       = Training   runtime
    22.9s        = Validation runtime
Completed 1/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the
1231.44s of remaining time.
    -167.0368      = Validation score    (-mean_absolute_error)
    0.72s         = Training   runtime
    0.0s          = Validation runtime
Fitting 9 L2 models ...
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 546.84s of the
1230.69s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -170.4449      = Validation score    (-mean_absolute_error)
    2.33s         = Training   runtime
    0.13s         = Validation runtime
Fitting model: LightGBM_BAG_L2 ... Training model for up to 543.29s of the
1227.14s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -168.9571      = Validation score    (-mean_absolute_error)
    2.18s         = Training   runtime
    0.08s         = Validation runtime
Fitting model: RandomForestMSE_BAG_L2 ... Training model for up to 539.79s of

```

the 1223.64s of remaining time.

```

-168.343      = Validation score    (-mean_absolute_error)
14.75s       = Training   runtime
1.32s        = Validation runtime

```

Fitting model: CatBoost_BAG_L2 ... Training model for up to 523.06s of the 1206.91s of remaining time.

```

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-168.554      = Validation score    (-mean_absolute_error)
4.36s        = Training   runtime
0.04s        = Validation runtime

```

Fitting model: ExtraTreesMSE_BAG_L2 ... Training model for up to 517.51s of the 1201.35s of remaining time.

```

-167.805      = Validation score    (-mean_absolute_error)
2.59s        = Training   runtime
1.31s        = Validation runtime

```

Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 512.94s of the 1196.79s of remaining time.

```

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-166.8606     = Validation score    (-mean_absolute_error)
39.44s       = Training   runtime
0.49s        = Validation runtime

```

Fitting model: XGBoost_BAG_L2 ... Training model for up to 472.17s of the 1156.02s of remaining time.

```

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-168.3036     = Validation score    (-mean_absolute_error)
2.67s        = Training   runtime
0.11s        = Validation runtime

```

Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 468.1s of the 1151.94s of remaining time.

```

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-167.6763     = Validation score    (-mean_absolute_error)
50.57s       = Training   runtime
0.52s        = Validation runtime

```

Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 416.26s of the 1100.1s of remaining time.

```

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-169.6263     = Validation score    (-mean_absolute_error)
6.17s        = Training   runtime
0.22s        = Validation runtime

```

Repeating k-fold bagging: 2/20

Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 408.78s of the 1092.63s of remaining time.

```

Fitting 8 child models (S2F1 - S2F8) | Fitting with

```

```

ParallelLocalFoldFittingStrategy
    -169.5589      = Validation score    (-mean_absolute_error)
    4.66s         = Training   runtime
    0.27s         = Validation runtime
Fitting model: LightGBM_BAG_L2 ... Training model for up to 405.14s of the
1088.99s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -168.0902      = Validation score    (-mean_absolute_error)
    4.07s          = Training   runtime
    0.16s          = Validation runtime
Fitting model: CatBoost_BAG_L2 ... Training model for up to 401.91s of the
1085.75s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -168.0431      = Validation score    (-mean_absolute_error)
    9.62s          = Training   runtime
    0.08s          = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 395.33s of
the 1079.18s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -166.2009      = Validation score    (-mean_absolute_error)
    79.31s         = Training   runtime
    0.98s          = Validation runtime
Fitting model: XGBoost_BAG_L2 ... Training model for up to 354.17s of the
1038.02s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -167.4693      = Validation score    (-mean_absolute_error)
    5.42s          = Training   runtime
    0.23s          = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 350.06s of the
1033.9s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -166.5435      = Validation score    (-mean_absolute_error)
    91.3s          = Training   runtime
    1.06s          = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 308.04s of the
991.89s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -168.7157      = Validation score    (-mean_absolute_error)
    12.07s         = Training   runtime
    0.39s          = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 300.9s of the

```


984.75s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-169.1559 = Validation score (-mean_absolute_error)
7.2s = Training runtime
0.41s = Validation runtime

Fitting model: LightGBM_BAG_L2 ... Training model for up to 297.16s of the
981.0s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-167.783 = Validation score (-mean_absolute_error)
6.01s = Training runtime
0.24s = Validation runtime

Fitting model: CatBoost_BAG_L2 ... Training model for up to 293.95s of the
977.79s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-168.0872 = Validation score (-mean_absolute_error)
14.16s = Training runtime
0.12s = Validation runtime

Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 288.08s of
the 971.93s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-165.9411 = Validation score (-mean_absolute_error)
119.1s = Training runtime
1.48s = Validation runtime

Fitting model: XGBoost_BAG_L2 ... Training model for up to 246.96s of the
930.81s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-167.1724 = Validation score (-mean_absolute_error)
8.14s = Training runtime
0.34s = Validation runtime

Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 242.89s of the
926.74s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-166.1757 = Validation score (-mean_absolute_error)
132.98s = Training runtime
1.67s = Validation runtime

Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 199.98s of the
883.83s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-168.0825 = Validation score (-mean_absolute_error)
18.51s = Training runtime
0.58s = Validation runtime

Repeating k-fold bagging: 4/20

Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 192.27s of the 876.12s of remaining time.

 Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -169.0179 = Validation score (-mean_absolute_error)
 9.9s = Training runtime
 0.57s = Validation runtime

Fitting model: LightGBM_BAG_L2 ... Training model for up to 188.26s of the 872.1s of remaining time.

 Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -167.6271 = Validation score (-mean_absolute_error)
 7.94s = Training runtime
 0.32s = Validation runtime

Fitting model: CatBoost_BAG_L2 ... Training model for up to 185.03s of the 868.88s of remaining time.

 Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -168.101 = Validation score (-mean_absolute_error)
 20.24s = Training runtime
 0.15s = Validation runtime

Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 177.56s of the 861.4s of remaining time.

 Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -165.8368 = Validation score (-mean_absolute_error)
 159.14s = Training runtime
 1.98s = Validation runtime

Fitting model: XGBoost_BAG_L2 ... Training model for up to 136.26s of the 820.11s of remaining time.

 Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -166.9785 = Validation score (-mean_absolute_error)
 10.75s = Training runtime
 0.46s = Validation runtime

Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 132.15s of the 816.0s of remaining time.

 Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -166.1078 = Validation score (-mean_absolute_error)
 171.31s = Training runtime
 2.2s = Validation runtime

Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 92.37s of the 776.22s of remaining time.

 Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -167.9751 = Validation score (-mean_absolute_error)

```

24.93s = Training runtime
0.77s = Validation runtime
Completed 4/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L3 ... Training model for up to 360.0s of the
768.53s of remaining time.
-163.5561 = Validation score (-mean_absolute_error)
0.59s = Training runtime
0.0s = Validation runtime
Fitting 9 L3 models ...
Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 511.82s of the
767.9s of remaining time.
Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-169.5965 = Validation score (-mean_absolute_error)
1.87s = Training runtime
0.1s = Validation runtime
Fitting model: LightGBM_BAG_L3 ... Training model for up to 508.77s of the
764.86s of remaining time.
Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-168.9985 = Validation score (-mean_absolute_error)
2.18s = Training runtime
0.08s = Validation runtime
Fitting model: RandomForestMSE_BAG_L3 ... Training model for up to 505.26s of
the 761.34s of remaining time.
-167.3699 = Validation score (-mean_absolute_error)
14.08s = Training runtime
1.23s = Validation runtime
Fitting model: CatBoost_BAG_L3 ... Training model for up to 489.3s of the
745.39s of remaining time.
Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-167.7881 = Validation score (-mean_absolute_error)
3.87s = Training runtime
0.04s = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L3 ... Training model for up to 484.25s of the
740.34s of remaining time.
-167.2583 = Validation score (-mean_absolute_error)
2.46s = Training runtime
1.23s = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 479.9s of the
735.99s of remaining time.
Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-166.6116 = Validation score (-mean_absolute_error)
39.15s = Training runtime
0.53s = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 439.45s of the

```

695.54s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-167.6172 = Validation score (-mean_absolute_error)
2.93s = Training runtime
0.12s = Validation runtime

Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 435.25s of the
691.34s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-165.3506 = Validation score (-mean_absolute_error)
36.41s = Training runtime
0.52s = Validation runtime

Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 397.58s of the
653.67s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-169.1751 = Validation score (-mean_absolute_error)
5.32s = Training runtime
0.16s = Validation runtime

Repeating k-fold bagging: 2/20

Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 391.01s of the
647.1s of remaining time.

Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy

-168.9777 = Validation score (-mean_absolute_error)
3.72s = Training runtime
0.19s = Validation runtime

Fitting model: LightGBM_BAG_L3 ... Training model for up to 387.91s of the
644.0s of remaining time.

Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy

-167.8651 = Validation score (-mean_absolute_error)
4.33s = Training runtime
0.16s = Validation runtime

Fitting model: CatBoost_BAG_L3 ... Training model for up to 384.56s of the
640.65s of remaining time.

Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy

-167.4067 = Validation score (-mean_absolute_error)
7.32s = Training runtime
0.08s = Validation runtime

Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 379.77s of
the 635.86s of remaining time.

Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy

-165.8049 = Validation score (-mean_absolute_error)
78.96s = Training runtime

```

    1.07s      = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 338.6s of the 594.69s
of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -166.9316      = Validation score      (-mean_absolute_error)
    5.46s      = Training runtime
    0.23s      = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 334.85s of the
590.94s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -164.6459      = Validation score      (-mean_absolute_error)
    76.02s      = Training runtime
    1.0s      = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 294.01s of the
550.1s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -167.8552      = Validation score      (-mean_absolute_error)
    11.37s      = Training runtime
    0.35s      = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 286.74s of the
542.83s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -168.8175      = Validation score      (-mean_absolute_error)
    5.51s      = Training runtime
    0.28s      = Validation runtime
Fitting model: LightGBM_BAG_L3 ... Training model for up to 283.76s of the
539.85s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -167.4138      = Validation score      (-mean_absolute_error)
    6.31s      = Training runtime
    0.24s      = Validation runtime
Fitting model: CatBoost_BAG_L3 ... Training model for up to 280.48s of the
536.57s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -167.3887      = Validation score      (-mean_absolute_error)
    10.81s      = Training runtime
    0.11s      = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 275.65s of
the 531.74s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

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```

-165.6509      = Validation score    (-mean_absolute_error)
-166.5318      = Validation score    (-mean_absolute_error)
8.15s         = Training   runtime
0.34s         = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 230.58s of the
486.67s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
-164.3146      = Validation score    (-mean_absolute_error)
122.61s        = Training   runtime
1.52s          = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 182.74s of the
438.83s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
-165.5277      = Validation score    (-mean_absolute_error)
158.17s        = Training   runtime
2.09s          = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 122.68s of the
378.77s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
-166.2483      = Validation score    (-mean_absolute_error)
10.71s         = Training   runtime
0.46s          = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 118.75s of the
374.84s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
-164.1777      = Validation score    (-mean_absolute_error)
163.6s         = Training   runtime
2.28s          = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 76.47s of the
332.56s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
-167.0436      = Validation score    (-mean_absolute_error)
22.49s         = Training   runtime
0.71s          = Validation runtime
Completed 4/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L4 ... Training model for up to 360.0s of the
325.93s of remaining time.
-163.0614      = Validation score    (-mean_absolute_error)
0.6s           = Training   runtime
0.0s           = Validation runtime
Fitting 9 L4 models ...
Fitting model: LightGBMXT_BAG_L4 ... Training model for up to 325.31s of the
325.3s of remaining time.

```

```

    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -169.1116      = Validation score    (-mean_absolute_error)
    1.83s         = Training   runtime
    0.09s         = Validation runtime
Fitting model: LightGBM_BAG_L4 ... Training model for up to 322.26s of the
322.25s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -167.752      = Validation score    (-mean_absolute_error)
    2.03s         = Training   runtime
    0.08s         = Validation runtime
Fitting model: RandomForestMSE_BAG_L4 ... Training model for up to 319.03s of
the 319.02s of remaining time.
    -166.2977     = Validation score    (-mean_absolute_error)
    13.6s         = Training   runtime
    1.25s         = Validation runtime
Fitting model: CatBoost_BAG_L4 ... Training model for up to 303.54s of the
303.53s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -167.4687     = Validation score    (-mean_absolute_error)
    3.59s         = Training   runtime
    0.04s         = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L4 ... Training model for up to 298.79s of the
298.78s of remaining time.
    -166.2655     = Validation score    (-mean_absolute_error)
    2.47s         = Training   runtime
    1.22s         = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 ... Training model for up to 294.46s of
the 294.44s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -167.2927     = Validation score    (-mean_absolute_error)
    39.7s         = Training   runtime
    0.5s          = Validation runtime
Fitting model: XGBoost_BAG_L4 ... Training model for up to 253.49s of the
253.48s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -167.4524     = Validation score    (-mean_absolute_error)
    2.91s         = Training   runtime
    0.13s         = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 ... Training model for up to 249.29s of the
249.28s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -165.3646     = Validation score    (-mean_absolute_error)

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40.22s = Training runtime
0.62s = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 ... Training model for up to 207.62s of the
207.61s of remaining time.
Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-167.8075 = Validation score (-mean_absolute_error)
6.33s = Training runtime
0.18s = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L4 ... Training model for up to 199.93s of the
199.92s of remaining time.
Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
-168.698 = Validation score (-mean_absolute_error)
3.7s = Training runtime
0.18s = Validation runtime
Fitting model: LightGBM_BAG_L4 ... Training model for up to 196.9s of the
196.89s of remaining time.
Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
-167.4411 = Validation score (-mean_absolute_error)
4.0s = Training runtime
0.16s = Validation runtime
Fitting model: CatBoost_BAG_L4 ... Training model for up to 193.72s of the
193.7s of remaining time.
Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
-167.2325 = Validation score (-mean_absolute_error)
7.15s = Training runtime
0.07s = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 ... Training model for up to 188.97s of
the 188.96s of remaining time.
Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
-165.9181 = Validation score (-mean_absolute_error)
79.56s = Training runtime
1.0s = Validation runtime
Fitting model: XGBoost_BAG_L4 ... Training model for up to 147.74s of the
147.73s of remaining time.
Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
-166.9144 = Validation score (-mean_absolute_error)
5.44s = Training runtime
0.24s = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 ... Training model for up to 143.96s of the
143.95s of remaining time.
Fitting 8 child models (S2F1 - S2F8) | Fitting with

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ParallelLocalFoldFittingStrategy
    -164.6149      = Validation score    (-mean_absolute_error)
    87.39s        = Training    runtime
    1.11s        = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 ... Training model for up to 95.53s of the
95.52s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -166.8029      = Validation score    (-mean_absolute_error)
    12.22s        = Training    runtime
    0.36s        = Validation runtime
Completed 2/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L5 ... Training model for up to 360.0s of the
88.39s of remaining time.
    -162.8902      = Validation score    (-mean_absolute_error)
    0.59s        = Training    runtime
    0.0s         = Validation runtime
AutoGluon training complete, total runtime = 1712.25s ... Best model:
"WeightedEnsemble_L5"
TabularPredictor saved. To load, use: predictor =
TabularPredictor.load("AutogluonModels/submission_87_A/")
Evaluation: mean_absolute_error on test data: -185.37534710476865
    Note: Scores are always higher_is_better. This metric score can be
multiplied by -1 to get the metric value.
Evaluations on test data:
{
    "mean_absolute_error": -185.37534710476865,
    "root_mean_squared_error": -419.7745198155876,
    "mean_squared_error": -176210.64748640716,
    "r2": 0.8721479365837096,
    "pearsonr": 0.9347973272756952,
    "median_absolute_error": -4.611132812499818
}

Evaluation on test data:
-185.37534710476865

```

```

[10]: loc = "B"
      predictors[1] = fit_predictor_for_location(loc)

```

```

Beginning AutoGluon training ... Time limit = 1800s
AutoGluon will save models to "AutogluonModels/submission_87_B/"
AutoGluon Version: 0.8.2
Python Version: 3.10.12
Operating System: Linux
Platform Machine: x86_64
Platform Version: #1 SMP Debian 5.10.197-1 (2023-09-29)
Disk Space Avail: 297.27 GB / 315.93 GB (94.1%)
Train Data Rows: 30768

```

```

Train Data Columns: 46
Label Column: y
Preprocessing data ...
AutoGluon infers your prediction problem is: 'regression' (because dtype of
label-column == float and many unique label-values observed).
    Label info (max, min, mean, stddev): (1152.3, -0.0, 97.74541, 195.0957)
    If 'regression' is not the correct problem_type, please manually specify
the problem_type parameter during predictor init (You may specify problem_type
as one of: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
    Available Memory: 130715.79 MB
    Train Data (Original) Memory Usage: 12.86 MB (0.0% of available memory)
    Inferring data type of each feature based on column values. Set
feature_metadata_in to manually specify special dtypes of the features.
    Stage 1 Generators:
        Fitting AsTypeFeatureGenerator...
            Note: Converting 4 features to boolean dtype as they
only contain 2 unique values.
    Stage 2 Generators:
        Fitting FillNaFeatureGenerator...
    Stage 3 Generators:
        Fitting IdentityFeatureGenerator...
    Stage 4 Generators:
        Fitting DropUniqueFeatureGenerator...

Training model for location B..
Train data sample weight sum: 30768
Train data number of rows: 30768
Test data sample weight sum: 2051
Test data number of rows: 2051

    Stage 5 Generators:
        Fitting DropDuplicatesFeatureGenerator...
    Useless Original Features (Count: 3): ['elevation:m', 'sample_weight',
'location']
        These features carry no predictive signal and should be manually
investigated.
        This is typically a feature which has the same value for all
rows.
        These features do not need to be present at inference time.
    Types of features in original data (raw dtype, special dtypes):
        ('float', []) : 42 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', ...]
        ('int', []) : 1 | ['is_estimated']
    Types of features in processed data (raw dtype, special dtypes):
        ('float', []) : 39 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',

```

```

'clear_sky_rad:W', ...]
      ('int', ['bool']) : 4 | ['is_day:idx', 'is_in_shadow:idx',
'wind_speed_w_1000hPa:ms', 'is_estimated']
0.2s = Fit runtime
43 features in original data used to generate 43 features in processed
data.

Train Data (Processed) Memory Usage: 9.72 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.19s ...
AutoGluon will gauge predictive performance using evaluation metric:
'mean_absolute_error'

This metric's sign has been flipped to adhere to being higher_is_better.
The metric score can be multiplied by -1 to get the metric value.

To change this, specify the eval_metric parameter of Predictor()
User-specified model hyperparameters to be fit:
{
    'NN_TORCH': {},
    'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}],
'GBMLarge'],
    'CAT': {},
    'XGB': {},
    'FASTAI': {},
    'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}]},
    'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}]},
    'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}},
{'weights': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
AutoGluon will fit 4 stack levels (L1 to L4) ...
Fitting 11 L1 models ...
Fitting model: KNeighborsUnif_BAG_L1 ... Training model for up to 599.78s of the
1799.8s of remaining time.
-57.5698          = Validation score    (-mean_absolute_error)
0.04s            = Training    runtime
0.69s            = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 ... Training model for up to 598.88s of the
1798.9s of remaining time.
-57.4932          = Validation score    (-mean_absolute_error)
0.04s            = Training    runtime
0.44s            = Validation runtime
Fitting model: LightGBMXT_BAG_L1 ... Training model for up to 598.35s of the
1798.37s of remaining time.

```

```

    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -31.7359      = Validation score    (-mean_absolute_error)
    32.39s       = Training    runtime
    14.1s        = Validation runtime
Fitting model: LightGBM_BAG_L1 ... Training model for up to 562.78s of the
1762.8s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -32.3317      = Validation score    (-mean_absolute_error)
    35.42s       = Training    runtime
    16.4s        = Validation runtime
Fitting model: RandomForestMSE_BAG_L1 ... Training model for up to 523.27s of
the 1723.29s of remaining time.
    -36.2588      = Validation score    (-mean_absolute_error)
    9.49s        = Training    runtime
    1.17s        = Validation runtime
Fitting model: CatBoost_BAG_L1 ... Training model for up to 512.11s of the
1712.12s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -34.1753      = Validation score    (-mean_absolute_error)
    200.62s      = Training    runtime
    0.09s        = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L1 ... Training model for up to 310.29s of the
1510.3s of remaining time.
    -37.0616      = Validation score    (-mean_absolute_error)
    1.93s        = Training    runtime
    1.19s        = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 ... Training model for up to 306.6s of the
1506.62s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -40.1174      = Validation score    (-mean_absolute_error)
    37.62s       = Training    runtime
    0.55s        = Validation runtime
Fitting model: XGBoost_BAG_L1 ... Training model for up to 267.79s of the
1467.81s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -34.8872      = Validation score    (-mean_absolute_error)
    96.88s       = Training    runtime
    23.39s       = Validation runtime
Fitting model: NeuralNetTorch_BAG_L1 ... Training model for up to 166.88s of the
1366.9s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -33.3318      = Validation score    (-mean_absolute_error)

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134.38s = Training runtime
0.37s   = Validation runtime
Fitting model: LightGBMLarge_BAG_L1 ... Training model for up to 31.17s of the
1231.19s of remaining time.
Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-31.1206 = Validation score (-mean_absolute_error)
26.79s   = Training runtime
4.39s    = Validation runtime
Completed 1/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the
1201.76s of remaining time.
-30.2352 = Validation score (-mean_absolute_error)
0.73s    = Training runtime
0.0s     = Validation runtime
Fitting 9 L2 models ...
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 533.65s of the
1200.99s of remaining time.
Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-28.1734 = Validation score (-mean_absolute_error)
3.8s     = Training runtime
0.29s    = Validation runtime
Fitting model: LightGBM_BAG_L2 ... Training model for up to 528.55s of the
1195.9s of remaining time.
Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-27.8504 = Validation score (-mean_absolute_error)
2.55s    = Training runtime
0.12s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L2 ... Training model for up to 524.82s of
the 1192.17s of remaining time.
-26.8497 = Validation score (-mean_absolute_error)
13.74s   = Training runtime
1.21s    = Validation runtime
Fitting model: CatBoost_BAG_L2 ... Training model for up to 509.34s of the
1176.69s of remaining time.
Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-27.9982 = Validation score (-mean_absolute_error)
13.44s   = Training runtime
0.04s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L2 ... Training model for up to 494.74s of the
1162.09s of remaining time.
-27.1079 = Validation score (-mean_absolute_error)
2.33s    = Training runtime
1.23s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 490.62s of

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the 1157.97s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-27.3403 = Validation score (-mean_absolute_error)
37.93s = Training runtime
0.51s = Validation runtime

Fitting model: XGBoost_BAG_L2 ... Training model for up to 451.46s of the
1118.81s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-27.5295 = Validation score (-mean_absolute_error)
2.93s = Training runtime
0.13s = Validation runtime

Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 447.19s of the
1114.54s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-27.2628 = Validation score (-mean_absolute_error)
87.88s = Training runtime
0.55s = Validation runtime

Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 358.06s of the
1025.41s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-27.1834 = Validation score (-mean_absolute_error)
69.59s = Training runtime
1.89s = Validation runtime

Completed 1/20 k-fold bagging repeats ...

Fitting model: WeightedEnsemble_L3 ... Training model for up to 360.0s of the
951.37s of remaining time.

-26.3746 = Validation score (-mean_absolute_error)
0.58s = Training runtime
0.0s = Validation runtime

Fitting 9 L3 models ...

Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 633.69s of the
950.76s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-27.2481 = Validation score (-mean_absolute_error)
1.84s = Training runtime
0.11s = Validation runtime

Fitting model: LightGBM_BAG_L3 ... Training model for up to 630.63s of the
947.7s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-27.043 = Validation score (-mean_absolute_error)
1.85s = Training runtime
0.08s = Validation runtime

Fitting model: RandomForestMSE_BAG_L3 ... Training model for up to 627.31s of the 944.38s of remaining time.

- 26.703 = Validation score (-mean_absolute_error)
- 13.83s = Training runtime
- 1.22s = Validation runtime

Fitting model: CatBoost_BAG_L3 ... Training model for up to 611.74s of the 928.81s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFittingStrategy

- 27.058 = Validation score (-mean_absolute_error)
- 3.69s = Training runtime
- 0.04s = Validation runtime

Fitting model: ExtraTreesMSE_BAG_L3 ... Training model for up to 606.85s of the 923.92s of remaining time.

- 26.6627 = Validation score (-mean_absolute_error)
- 2.37s = Training runtime
- 1.23s = Validation runtime

Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 602.7s of the 919.77s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFittingStrategy

- 26.8083 = Validation score (-mean_absolute_error)
- 37.97s = Training runtime
- 0.49s = Validation runtime

Fitting model: XGBoost_BAG_L3 ... Training model for up to 563.48s of the 880.55s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFittingStrategy

- 26.8029 = Validation score (-mean_absolute_error)
- 2.51s = Training runtime
- 0.11s = Validation runtime

Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 559.56s of the 876.63s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFittingStrategy

- 26.4539 = Validation score (-mean_absolute_error)
- 41.17s = Training runtime
- 0.51s = Validation runtime

Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 517.07s of the 834.14s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFittingStrategy

- 26.8632 = Validation score (-mean_absolute_error)
- 6.78s = Training runtime
- 0.23s = Validation runtime

Repeating k-fold bagging: 2/20

Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 508.91s of the 825.98s of remaining time.

```

    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -27.1968      = Validation score    (-mean_absolute_error)
    3.77s        = Training    runtime
    0.2s         = Validation runtime
Fitting model: LightGBM_BAG_L3 ... Training model for up to 505.81s of the
822.88s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.9302      = Validation score    (-mean_absolute_error)
    3.88s        = Training    runtime
    0.17s        = Validation runtime
Fitting model: CatBoost_BAG_L3 ... Training model for up to 502.6s of the
819.66s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.9896      = Validation score    (-mean_absolute_error)
    7.6s         = Training    runtime
    0.07s        = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 497.33s of
the 814.4s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.6248      = Validation score    (-mean_absolute_error)
    75.62s       = Training    runtime
    0.97s        = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 458.38s of the
775.45s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.7098      = Validation score    (-mean_absolute_error)
    5.05s        = Training    runtime
    0.22s        = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 454.42s of the
771.49s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.3034      = Validation score    (-mean_absolute_error)
    83.18s       = Training    runtime
    1.01s        = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 411.1s of the
728.17s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.7552      = Validation score    (-mean_absolute_error)
    12.75s       = Training    runtime
    0.43s        = Validation runtime
Repeating k-fold bagging: 3/20

```


Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 403.91s of the 720.98s of remaining time.
 Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFittingStrategy
 -27.146 = Validation score (-mean_absolute_error)
 5.76s = Training runtime
 0.31s = Validation runtime

Fitting model: LightGBM_BAG_L3 ... Training model for up to 400.66s of the 717.73s of remaining time.
 Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFittingStrategy
 -26.8696 = Validation score (-mean_absolute_error)
 5.82s = Training runtime
 0.25s = Validation runtime

Fitting model: CatBoost_BAG_L3 ... Training model for up to 397.5s of the 714.57s of remaining time.
 Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFittingStrategy
 -26.9509 = Validation score (-mean_absolute_error)
 11.99s = Training runtime
 0.1s = Validation runtime

Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 391.95s of the 709.01s of remaining time.
 Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFittingStrategy
 -26.5301 = Validation score (-mean_absolute_error)
 113.58s = Training runtime
 1.49s = Validation runtime

Fitting model: XGBoost_BAG_L3 ... Training model for up to 352.6s of the 669.66s of remaining time.
 Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFittingStrategy
 -26.6585 = Validation score (-mean_absolute_error)
 7.85s = Training runtime
 0.34s = Validation runtime

Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 348.57s of the 665.64s of remaining time.
 Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFittingStrategy
 -26.2363 = Validation score (-mean_absolute_error)
 133.16s = Training runtime
 1.57s = Validation runtime

Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 297.22s of the 614.29s of remaining time.
 Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFittingStrategy
 -26.6486 = Validation score (-mean_absolute_error)
 19.14s = Training runtime

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    0.66s      = Validation runtime
Repeating k-fold bagging: 4/20
Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 289.57s of the
606.64s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -27.124    = Validation score    (-mean_absolute_error)
    7.66s      = Training    runtime
    0.41s      = Validation runtime
Fitting model: LightGBM_BAG_L3 ... Training model for up to 286.47s of the
603.54s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.8502    = Validation score    (-mean_absolute_error)
    7.65s      = Training    runtime
    0.32s      = Validation runtime
Fitting model: CatBoost_BAG_L3 ... Training model for up to 283.36s of the
600.43s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.9393    = Validation score    (-mean_absolute_error)
    17.06s     = Training    runtime
    0.14s      = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 276.99s of
the 594.06s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.4943    = Validation score    (-mean_absolute_error)
    151.43s    = Training    runtime
    2.01s      = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 237.89s of the
554.96s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.6357    = Validation score    (-mean_absolute_error)
    10.64s     = Training    runtime
    0.46s      = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 233.89s of the
550.96s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.2153    = Validation score    (-mean_absolute_error)
    178.36s    = Training    runtime
    2.06s      = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 187.32s of the
504.39s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy

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-26.6029          = Validation score    (-mean_absolute_error)
29.14s           = Training   runtime
0.99s            = Validation runtime
Repeating k-fold bagging: 5/20
Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 175.93s of the
493.0s of remaining time.
    Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
-27.1196          = Validation score    (-mean_absolute_error)
9.48s             = Training   runtime
0.52s             = Validation runtime
Fitting model: LightGBM_BAG_L3 ... Training model for up to 172.8s of the
489.87s of remaining time.
    Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
-26.8503          = Validation score    (-mean_absolute_error)
9.45s             = Training   runtime
0.41s             = Validation runtime
Fitting model: CatBoost_BAG_L3 ... Training model for up to 169.78s of the
486.84s of remaining time.
    Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
-26.9404          = Validation score    (-mean_absolute_error)
21.13s            = Training   runtime
0.18s             = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 164.52s of
the 481.59s of remaining time.
    Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
-26.4822          = Validation score    (-mean_absolute_error)
188.89s           = Training   runtime
2.53s             = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 125.69s of the
442.76s of remaining time.
    Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
-26.6484          = Validation score    (-mean_absolute_error)
13.25s            = Training   runtime
0.57s             = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 121.58s of the
438.64s of remaining time.
    Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
-26.2068          = Validation score    (-mean_absolute_error)
225.82s           = Training   runtime
2.6s              = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 72.84s of the
389.91s of remaining time.

```

```

    Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.5967      = Validation score    (-mean_absolute_error)
    39.47s       = Training    runtime
    1.34s        = Validation runtime
Completed 5/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L4 ... Training model for up to 360.0s of the
378.16s of remaining time.
    -26.0293      = Validation score    (-mean_absolute_error)
    0.59s        = Training    runtime
    0.0s         = Validation runtime
Fitting 9 L4 models ...
Fitting model: LightGBMXT_BAG_L4 ... Training model for up to 377.55s of the
377.53s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -27.1533      = Validation score    (-mean_absolute_error)
    1.83s        = Training    runtime
    0.09s        = Validation runtime
Fitting model: LightGBM_BAG_L4 ... Training model for up to 374.54s of the
374.53s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.9643      = Validation score    (-mean_absolute_error)
    1.86s        = Training    runtime
    0.08s        = Validation runtime
Fitting model: RandomForestMSE_BAG_L4 ... Training model for up to 371.25s of
the 371.24s of remaining time.
    -26.644      = Validation score    (-mean_absolute_error)
    13.86s       = Training    runtime
    1.23s        = Validation runtime
Fitting model: CatBoost_BAG_L4 ... Training model for up to 355.63s of the
355.62s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.8457      = Validation score    (-mean_absolute_error)
    3.74s        = Training    runtime
    0.04s        = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L4 ... Training model for up to 350.71s of the
350.7s of remaining time.
    -26.7369      = Validation score    (-mean_absolute_error)
    2.4s         = Training    runtime
    1.24s        = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 ... Training model for up to 346.52s of
the 346.51s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.7182      = Validation score    (-mean_absolute_error)

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38.22s    = Training    runtime
0.48s     = Validation runtime
Fitting model: XGBoost_BAG_L4 ... Training model for up to 306.98s of the
306.97s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.8683          = Validation score    (-mean_absolute_error)
    2.45s            = Training    runtime
    0.1s             = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 ... Training model for up to 303.12s of the
303.11s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.3698          = Validation score    (-mean_absolute_error)
    42.79s           = Training    runtime
    0.55s            = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 ... Training model for up to 258.96s of the
258.95s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.8522          = Validation score    (-mean_absolute_error)
    5.66s            = Training    runtime
    0.19s            = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L4 ... Training model for up to 252.01s of the
252.0s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -27.0795          = Validation score    (-mean_absolute_error)
    3.62s            = Training    runtime
    0.18s            = Validation runtime
Fitting model: LightGBM_BAG_L4 ... Training model for up to 248.94s of the
248.93s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.7872          = Validation score    (-mean_absolute_error)
    3.99s            = Training    runtime
    0.17s            = Validation runtime
Fitting model: CatBoost_BAG_L4 ... Training model for up to 245.61s of the
245.6s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.7903          = Validation score    (-mean_absolute_error)
    7.68s            = Training    runtime
    0.08s            = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 ... Training model for up to 240.36s of
the 240.35s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with

```

```

ParallelLocalFoldFittingStrategy
    -26.5807          = Validation score    (-mean_absolute_error)
    76.27s           = Training    runtime
    0.97s            = Validation runtime
Fitting model: XGBoost_BAG_L4 ... Training model for up to 200.9s of the 200.89s
of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.7375          = Validation score    (-mean_absolute_error)
    4.93s             = Training    runtime
    0.21s             = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 ... Training model for up to 197.16s of the
197.15s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.2279          = Validation score    (-mean_absolute_error)
    86.0s             = Training    runtime
    1.11s            = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 ... Training model for up to 152.69s of the
152.67s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -26.7166          = Validation score    (-mean_absolute_error)
    12.87s            = Training    runtime
    0.42s            = Validation runtime
Completed 2/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L5 ... Training model for up to 360.0s of the
144.1s of remaining time.
    -26.0379          = Validation score    (-mean_absolute_error)
    0.58s             = Training    runtime
    0.0s              = Validation runtime
AutoGluon training complete, total runtime = 1656.52s ... Best model:
"WeightedEnsemble_L4"
TabularPredictor saved. To load, use: predictor =
TabularPredictor.load("AutogluonModels/submission_87_B/")
Evaluation: mean_absolute_error on test data: -36.63727279472588
    Note: Scores are always higher_is_better. This metric score can be
multiplied by -1 to get the metric value.
Evaluations on test data:
{
    "mean_absolute_error": -36.63727279472588,
    "root_mean_squared_error": -88.72453645593494,
    "mean_squared_error": -7872.043369320529,
    "r2": 0.7468117405489736,
    "pearsonr": 0.8845040251968049,
    "median_absolute_error": -2.942364014375795
}

```

Evaluation on test data:
-36.63727279472588

```
[11]: loc = "C"  
      predictors[2] = fit_predictor_for_location(loc)
```

```
Beginning AutoGluon training ... Time limit = 1800s  
AutoGluon will save models to "AutogluonModels/submission_87_C/"  
AutoGluon Version: 0.8.2  
Python Version: 3.10.12  
Operating System: Linux  
Platform Machine: x86_64  
Platform Version: #1 SMP Debian 5.10.197-1 (2023-09-29)  
Disk Space Avail: 292.77 GB / 315.93 GB (92.7%)  
Train Data Rows: 24492  
Train Data Columns: 46  
Label Column: y  
Preprocessing data ...  
AutoGluon infers your prediction problem is: 'regression' (because dtype of  
label-column == float and label-values can't be converted to int).  
    Label info (max, min, mean, stddev): (999.6, 0.0, 78.11911, 167.50151)  
    If 'regression' is not the correct problem_type, please manually specify  
the problem_type parameter during predictor init (You may specify problem_type  
as one of: ['binary', 'multiclass', 'regression'])  
Using Feature Generators to preprocess the data ...  
Fitting AutoMLPipelineFeatureGenerator...  
    Available Memory: 127685.07 MB  
    Train Data (Original) Memory Usage: 10.24 MB (0.0% of available memory)  
    Inferring data type of each feature based on column values. Set  
feature_metadata_in to manually specify special dtypes of the features.  
    Stage 1 Generators:  
        Fitting AsTypeFeatureGenerator...  
            Note: Converting 3 features to boolean dtype as they  
only contain 2 unique values.  
    Stage 2 Generators:  
        Fitting FillNaFeatureGenerator...  
    Stage 3 Generators:  
        Fitting IdentityFeatureGenerator...  
    Stage 4 Generators:  
        Fitting DropUniqueFeatureGenerator...  
    Stage 5 Generators:  
        Fitting DropDuplicatesFeatureGenerator...  
    Useless Original Features (Count: 3): ['elevation:m', 'sample_weight',  
'location']  
        These features carry no predictive signal and should be manually  
investigated.  
        This is typically a feature which has the same value for all  
rows.
```

```

        These features do not need to be present at inference time.
Types of features in original data (raw dtype, special dtypes):
    ('float', []) : 42 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', ...]
    ('int', []) : 1 | ['is_estimated']
Types of features in processed data (raw dtype, special dtypes):

Training model for location C...
Train data sample weight sum: 24492
Train data number of rows: 24492
Test data sample weight sum: 1579
Test data number of rows: 1579

    ('float', []) : 40 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', ...]
    ('int', ['bool']) : 3 | ['is_day:idx', 'is_in_shadow:idx',
'is_estimated']
    0.1s = Fit runtime
    43 features in original data used to generate 43 features in processed
data.

    Train Data (Processed) Memory Usage: 7.91 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.16s ...
AutoGluon will gauge predictive performance using evaluation metric:
'mean_absolute_error'

    This metric's sign has been flipped to adhere to being higher_is_better.
The metric score can be multiplied by -1 to get the metric value.
    To change this, specify the eval_metric parameter of Predictor()
User-specified model hyperparameters to be fit:
{
    'NN_TORCH': {},
    'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}],
'GBMLarge'],
    'CAT': {},
    'XGB': {},
    'FASTAI': {},
    'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],
    'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],
    'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}},
{'weights': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],

```



```

}
AutoGluon will fit 4 stack levels (L1 to L4) ...
Fitting 11 L1 models ...
Fitting model: KNeighborsUnif_BAG_L1 ... Training model for up to 599.8s of the
1799.84s of remaining time.
    -32.6988      = Validation score    (-mean_absolute_error)
    0.03s      = Training    runtime
    0.29s      = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 ... Training model for up to 599.43s of the
1799.47s of remaining time.
    -32.7258      = Validation score    (-mean_absolute_error)
    0.03s      = Training    runtime
    0.29s      = Validation runtime
Fitting model: LightGBMXT_BAG_L1 ... Training model for up to 599.06s of the
1799.1s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.553      = Validation score    (-mean_absolute_error)
    29.06s      = Training    runtime
    13.33s      = Validation runtime
Fitting model: LightGBM_BAG_L1 ... Training model for up to 566.73s of the
1766.77s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -19.3784      = Validation score    (-mean_absolute_error)
    31.54s      = Training    runtime
    9.92s      = Validation runtime
Fitting model: RandomForestMSE_BAG_L1 ... Training model for up to 532.37s of
the 1732.41s of remaining time.
    -20.7654      = Validation score    (-mean_absolute_error)
    5.18s      = Training    runtime
    0.76s      = Validation runtime
Fitting model: CatBoost_BAG_L1 ... Training model for up to 526.12s of the
1726.16s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -19.7462      = Validation score    (-mean_absolute_error)
    197.53s      = Training    runtime
    0.08s      = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L1 ... Training model for up to 327.41s of the
1527.45s of remaining time.
    -20.7137      = Validation score    (-mean_absolute_error)
    1.14s      = Training    runtime
    0.82s      = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 ... Training model for up to 325.11s of
the 1525.15s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

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-21.079 = Validation score (-mean_absolute_error)
29.82s  = Training runtime
0.42s   = Validation runtime
Fitting model: XGBoost_BAG_L1 ... Training model for up to 294.03s of the
1494.07s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-20.2144 = Validation score (-mean_absolute_error)
55.29s   = Training runtime
3.21s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L1 ... Training model for up to 236.35s of the
1436.39s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-19.3858 = Validation score (-mean_absolute_error)
85.79s   = Training runtime
0.35s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L1 ... Training model for up to 149.36s of the
1349.4s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-18.9081 = Validation score (-mean_absolute_error)
100.4s   = Training runtime
20.43s   = Validation runtime
Completed 1/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the
1243.68s of remaining time.
-17.7931 = Validation score (-mean_absolute_error)
0.62s    = Training runtime
0.0s     = Validation runtime
Fitting 9 L2 models ...
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 552.32s of the
1243.02s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-18.3862 = Validation score (-mean_absolute_error)
2.46s    = Training runtime
0.12s    = Validation runtime
Fitting model: LightGBM_BAG_L2 ... Training model for up to 548.67s of the
1239.37s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
-18.2307 = Validation score (-mean_absolute_error)
2.09s    = Training runtime
0.07s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L2 ... Training model for up to 545.24s of
the 1235.94s of remaining time.
-17.9102 = Validation score (-mean_absolute_error)

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    9.23s    = Training    runtime
    0.83s    = Validation runtime
Fitting model: CatBoost_BAG_L2 ... Training model for up to 534.86s of the
1225.57s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.3757      = Validation score    (-mean_absolute_error)
    5.67s        = Training    runtime
    0.04s        = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L2 ... Training model for up to 528.04s of the
1218.74s of remaining time.
    -17.8801      = Validation score    (-mean_absolute_error)
    1.5s         = Training    runtime
    0.84s        = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 525.35s of
the 1216.06s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.9889      = Validation score    (-mean_absolute_error)
    29.89s       = Training    runtime
    0.38s        = Validation runtime
Fitting model: XGBoost_BAG_L2 ... Training model for up to 494.16s of the
1184.86s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0582      = Validation score    (-mean_absolute_error)
    2.88s        = Training    runtime
    0.09s        = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 489.89s of the
1180.59s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0861      = Validation score    (-mean_absolute_error)
    35.42s       = Training    runtime
    0.48s        = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 453.05s of the
1143.75s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.3122      = Validation score    (-mean_absolute_error)
    6.37s        = Training    runtime
    0.18s        = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 445.35s of the
1136.05s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.2281      = Validation score    (-mean_absolute_error)

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4.5s      = Training   runtime
0.23s     = Validation runtime
Fitting model: LightGBM_BAG_L2 ... Training model for up to 442.03s of the
1132.73s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0676      = Validation score    (-mean_absolute_error)
    4.07s        = Training   runtime
    0.14s        = Validation runtime
Fitting model: CatBoost_BAG_L2 ... Training model for up to 438.89s of the
1129.59s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.2567      = Validation score    (-mean_absolute_error)
    11.94s       = Training   runtime
    0.08s        = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 431.44s of
the 1122.14s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.8693      = Validation score    (-mean_absolute_error)
    60.77s       = Training   runtime
    0.77s        = Validation runtime
Fitting model: XGBoost_BAG_L2 ... Training model for up to 399.31s of the
1090.01s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.9658      = Validation score    (-mean_absolute_error)
    5.69s        = Training   runtime
    0.2s         = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 395.12s of the
1085.82s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.9333      = Validation score    (-mean_absolute_error)
    76.3s        = Training   runtime
    0.97s        = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 352.9s of the
1043.6s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.1146      = Validation score    (-mean_absolute_error)
    12.75s       = Training   runtime
    0.37s        = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 345.27s of the
1035.97s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with

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ParallelLocalFoldFittingStrategy
    -18.202 = Validation score    (-mean_absolute_error)
    6.81s   = Training   runtime
    0.37s   = Validation runtime
Fitting model: LightGBM_BAG_L2 ... Training model for up to 341.56s of the
1032.26s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0701 = Validation score    (-mean_absolute_error)
    5.96s    = Training   runtime
    0.21s    = Validation runtime
Fitting model: CatBoost_BAG_L2 ... Training model for up to 338.34s of the
1029.04s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.2557 = Validation score    (-mean_absolute_error)
    17.18s   = Training   runtime
    0.11s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 331.78s of
the 1022.48s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.8438 = Validation score    (-mean_absolute_error)
    91.5s    = Training   runtime
    1.25s    = Validation runtime
Fitting model: XGBoost_BAG_L2 ... Training model for up to 299.76s of the
990.45s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.9045 = Validation score    (-mean_absolute_error)
    9.05s    = Training   runtime
    0.31s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 295.12s of the
985.82s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.9161 = Validation score    (-mean_absolute_error)
    114.72s  = Training   runtime
    1.47s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 255.42s of the
946.12s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0723 = Validation score    (-mean_absolute_error)
    18.71s   = Training   runtime
    0.57s    = Validation runtime
Repeating k-fold bagging: 4/20
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 248.16s of the

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938.87s of remaining time.
 Fitting 8 child models (S4F1 - S4F8) | Fitting with
 ParallelLocalFoldFittingStrategy
 -18.1958 = Validation score (-mean_absolute_error)
 9.06s = Training runtime
 0.48s = Validation runtime
 Fitting model: LightGBM_BAG_L2 ... Training model for up to 244.52s of the
 935.22s of remaining time.
 Fitting 8 child models (S4F1 - S4F8) | Fitting with
 ParallelLocalFoldFittingStrategy
 -18.0659 = Validation score (-mean_absolute_error)
 7.92s = Training runtime
 0.28s = Validation runtime
 Fitting model: CatBoost_BAG_L2 ... Training model for up to 241.28s of the
 931.98s of remaining time.
 Fitting 8 child models (S4F1 - S4F8) | Fitting with
 ParallelLocalFoldFittingStrategy
 -18.251 = Validation score (-mean_absolute_error)
 22.75s = Training runtime
 0.14s = Validation runtime
 Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 234.43s of
 the 925.13s of remaining time.
 Fitting 8 child models (S4F1 - S4F8) | Fitting with
 ParallelLocalFoldFittingStrategy
 -17.8058 = Validation score (-mean_absolute_error)
 122.61s = Training runtime
 1.63s = Validation runtime
 Fitting model: XGBoost_BAG_L2 ... Training model for up to 202.06s of the
 892.76s of remaining time.
 Fitting 8 child models (S4F1 - S4F8) | Fitting with
 ParallelLocalFoldFittingStrategy
 -17.9006 = Validation score (-mean_absolute_error)
 12.06s = Training runtime
 0.41s = Validation runtime
 Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 197.73s of the
 888.43s of remaining time.
 Fitting 8 child models (S4F1 - S4F8) | Fitting with
 ParallelLocalFoldFittingStrategy
 -17.8654 = Validation score (-mean_absolute_error)
 163.61s = Training runtime
 1.99s = Validation runtime
 Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 147.61s of the
 838.31s of remaining time.
 Fitting 8 child models (S4F1 - S4F8) | Fitting with
 ParallelLocalFoldFittingStrategy
 -18.0077 = Validation score (-mean_absolute_error)
 24.66s = Training runtime
 0.74s = Validation runtime

Repeating k-fold bagging: 5/20

Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 140.4s of the 831.1s of remaining time.

 Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -18.2012 = Validation score (-mean_absolute_error)
 11.07s = Training runtime
 0.61s = Validation runtime

Fitting model: LightGBM_BAG_L2 ... Training model for up to 137.12s of the 827.82s of remaining time.

 Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -18.0591 = Validation score (-mean_absolute_error)
 9.82s = Training runtime
 0.35s = Validation runtime

Fitting model: CatBoost_BAG_L2 ... Training model for up to 133.93s of the 824.63s of remaining time.

 Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -18.2225 = Validation score (-mean_absolute_error)
 29.46s = Training runtime
 0.18s = Validation runtime

Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 126.07s of the 816.77s of remaining time.

 Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -17.7777 = Validation score (-mean_absolute_error)
 153.23s = Training runtime
 2.01s = Validation runtime

Fitting model: XGBoost_BAG_L2 ... Training model for up to 94.17s of the 784.87s of remaining time.

 Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -17.8695 = Validation score (-mean_absolute_error)
 15.02s = Training runtime
 0.51s = Validation runtime

Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 89.85s of the 780.55s of remaining time.

 Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -17.84 = Validation score (-mean_absolute_error)
 211.09s = Training runtime
 2.47s = Validation runtime

Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 40.99s of the 731.69s of remaining time.

 Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy

 -18.0074 = Validation score (-mean_absolute_error)

```

    31.23s    = Training    runtime
    0.96s     = Validation runtime
Completed 5/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L3 ... Training model for up to 360.0s of the
723.76s of remaining time.
    -17.5124      = Validation score    (-mean_absolute_error)
    0.55s        = Training    runtime
    0.0s         = Validation runtime
Fitting 9 L3 models ...
Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 482.0s of the
723.17s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.3103      = Validation score    (-mean_absolute_error)
    1.75s        = Training    runtime
    0.07s        = Validation runtime
Fitting model: LightGBM_BAG_L3 ... Training model for up to 479.01s of the
720.18s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.3048      = Validation score    (-mean_absolute_error)
    1.83s        = Training    runtime
    0.06s        = Validation runtime
Fitting model: RandomForestMSE_BAG_L3 ... Training model for up to 475.85s of
the 717.02s of remaining time.
    -18.0152      = Validation score    (-mean_absolute_error)
    8.61s        = Training    runtime
    0.82s        = Validation runtime
Fitting model: CatBoost_BAG_L3 ... Training model for up to 466.11s of the
707.28s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.2105      = Validation score    (-mean_absolute_error)
    3.5s         = Training    runtime
    0.03s        = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L3 ... Training model for up to 461.41s of the
702.59s of remaining time.
    -17.9416      = Validation score    (-mean_absolute_error)
    1.58s        = Training    runtime
    0.82s        = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 458.67s of
the 699.84s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0828      = Validation score    (-mean_absolute_error)
    30.58s       = Training    runtime
    0.38s        = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 426.85s of the

```


668.02s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-18.2138 = Validation score (-mean_absolute_error)
2.59s = Training runtime
0.1s = Validation runtime

Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 422.73s of the
663.9s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-17.9311 = Validation score (-mean_absolute_error)
32.89s = Training runtime
0.46s = Validation runtime

Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 388.62s of the
629.79s of remaining time.

Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy

-18.3507 = Validation score (-mean_absolute_error)
5.53s = Training runtime
0.17s = Validation runtime

Repeating k-fold bagging: 2/20

Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 381.86s of the
623.03s of remaining time.

Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy

-18.2389 = Validation score (-mean_absolute_error)
3.49s = Training runtime
0.15s = Validation runtime

Fitting model: LightGBM_BAG_L3 ... Training model for up to 378.81s of the
619.99s of remaining time.

Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy

-18.182 = Validation score (-mean_absolute_error)
3.69s = Training runtime
0.13s = Validation runtime

Fitting model: CatBoost_BAG_L3 ... Training model for up to 375.7s of the
616.88s of remaining time.

Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy

-18.1779 = Validation score (-mean_absolute_error)
6.96s = Training runtime
0.07s = Validation runtime

Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 370.97s of
the 612.14s of remaining time.

Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy

-17.8676 = Validation score (-mean_absolute_error)
60.52s = Training runtime

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    0.8s      = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 339.55s of the
580.72s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0992      = Validation score    (-mean_absolute_error)
    5.12s        = Training    runtime
    0.19s        = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 335.55s of the
576.72s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.824      = Validation score    (-mean_absolute_error)
    69.36s       = Training    runtime
    0.94s        = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 297.77s of the
538.94s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.1874     = Validation score    (-mean_absolute_error)
    11.63s       = Training    runtime
    0.35s        = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 290.37s of the
531.55s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.2125     = Validation score    (-mean_absolute_error)
    5.34s        = Training    runtime
    0.23s        = Validation runtime
Fitting model: LightGBM_BAG_L3 ... Training model for up to 287.35s of the
528.52s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.1637     = Validation score    (-mean_absolute_error)
    5.51s        = Training    runtime
    0.19s        = Validation runtime
Fitting model: CatBoost_BAG_L3 ... Training model for up to 284.14s of the
525.31s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.1915     = Validation score    (-mean_absolute_error)
    10.45s       = Training    runtime
    0.1s         = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 279.38s of
the 520.55s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

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-17.8018          = Validation score    (-mean_absolute_error)
91.09s    = Training    runtime
1.19s     = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 247.52s of the 488.7s
of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
-18.0277          = Validation score    (-mean_absolute_error)
7.7s      = Training    runtime
0.28s     = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 243.48s of the
484.65s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
-17.799   = Validation score    (-mean_absolute_error)
107.69s   = Training    runtime
1.39s     = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 203.9s of the
445.07s of remaining time.
    Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
-18.1629          = Validation score    (-mean_absolute_error)
17.23s    = Training    runtime
0.51s     = Validation runtime
Repeating k-fold bagging: 4/20
Fitting model: LightGBMXT_BAG_L3 ... Training model for up to 197.07s of the
438.24s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
-18.2044          = Validation score    (-mean_absolute_error)
7.27s      = Training    runtime
0.31s      = Validation runtime
Fitting model: LightGBM_BAG_L3 ... Training model for up to 193.95s of the
435.12s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
-18.159   = Validation score    (-mean_absolute_error)
7.44s     = Training    runtime
0.26s     = Validation runtime
Fitting model: CatBoost_BAG_L3 ... Training model for up to 190.78s of the
431.95s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
-18.1831          = Validation score    (-mean_absolute_error)
15.08s    = Training    runtime
0.14s     = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 ... Training model for up to 185.0s of the
426.17s of remaining time.

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    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.7823      = Validation score    (-mean_absolute_error)
    121.41s      = Training    runtime
    1.59s        = Validation runtime
Fitting model: XGBoost_BAG_L3 ... Training model for up to 153.32s of the
394.49s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0249      = Validation score    (-mean_absolute_error)
    10.51s        = Training    runtime
    0.36s         = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 ... Training model for up to 149.3s of the
390.47s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.7696      = Validation score    (-mean_absolute_error)
    147.01s       = Training    runtime
    1.83s         = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 ... Training model for up to 108.67s of the
349.84s of remaining time.
    Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.1294      = Validation score    (-mean_absolute_error)
    23.77s        = Training    runtime
    0.69s         = Validation runtime
Completed 4/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L4 ... Training model for up to 360.0s of the
342.0s of remaining time.
    -17.5764      = Validation score    (-mean_absolute_error)
    0.53s         = Training    runtime
    0.0s          = Validation runtime
Fitting 9 L4 models ...
Fitting model: LightGBMXT_BAG_L4 ... Training model for up to 341.45s of the
341.43s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.408       = Validation score    (-mean_absolute_error)
    1.73s         = Training    runtime
    0.08s         = Validation runtime
Fitting model: LightGBM_BAG_L4 ... Training model for up to 338.49s of the
338.48s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.1731      = Validation score    (-mean_absolute_error)
    2.23s         = Training    runtime
    0.09s         = Validation runtime
Fitting model: RandomForestMSE_BAG_L4 ... Training model for up to 334.95s of

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the 334.94s of remaining time.
    -17.9208          = Validation score    (-mean_absolute_error)
    8.73s            = Training    runtime
    0.81s            = Validation runtime
Fitting model: CatBoost_BAG_L4 ... Training model for up to 325.1s of the
325.08s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.3522          = Validation score    (-mean_absolute_error)
    3.4s              = Training    runtime
    0.03s             = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L4 ... Training model for up to 320.4s of the
320.39s of remaining time.
    -18.0126          = Validation score    (-mean_absolute_error)
    1.58s             = Training    runtime
    0.83s             = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 ... Training model for up to 317.65s of
the 317.64s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.1121          = Validation score    (-mean_absolute_error)
    29.86s            = Training    runtime
    0.43s             = Validation runtime
Fitting model: XGBoost_BAG_L4 ... Training model for up to 286.53s of the
286.52s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.9991          = Validation score    (-mean_absolute_error)
    2.83s             = Training    runtime
    0.11s             = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 ... Training model for up to 282.28s of the
282.26s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0726          = Validation score    (-mean_absolute_error)
    39.04s            = Training    runtime
    0.46s             = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 ... Training model for up to 241.79s of the
241.78s of remaining time.
    Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.1924          = Validation score    (-mean_absolute_error)
    5.39s             = Training    runtime
    0.15s             = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L4 ... Training model for up to 235.11s of the
235.1s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with

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ParallelLocalFoldFittingStrategy
    -18.3378          = Validation score    (-mean_absolute_error)
    3.55s            = Training    runtime
    0.16s            = Validation runtime
Fitting model: LightGBM_BAG_L4 ... Training model for up to 231.96s of the
231.95s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0505          = Validation score    (-mean_absolute_error)
    4.38s            = Training    runtime
    0.16s            = Validation runtime
Fitting model: CatBoost_BAG_L4 ... Training model for up to 228.57s of the
228.55s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.2881          = Validation score    (-mean_absolute_error)
    6.97s            = Training    runtime
    0.07s            = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 ... Training model for up to 223.73s of
the 223.71s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.9711          = Validation score    (-mean_absolute_error)
    59.98s           = Training    runtime
    0.82s            = Validation runtime
Fitting model: XGBoost_BAG_L4 ... Training model for up to 192.25s of the
192.24s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.9325          = Validation score    (-mean_absolute_error)
    5.68s            = Training    runtime
    0.2s             = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 ... Training model for up to 188.18s of the
188.17s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -17.9687          = Validation score    (-mean_absolute_error)
    72.02s           = Training    runtime
    0.95s            = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 ... Training model for up to 153.8s of the
153.79s of remaining time.
    Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
    -18.0734          = Validation score    (-mean_absolute_error)
    11.69s           = Training    runtime
    0.35s            = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L4 ... Training model for up to 146.18s of the

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146.17s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-18.288 = Validation score (-mean_absolute_error)
5.28s = Training runtime
0.24s = Validation runtime

Fitting model: LightGBM_BAG_L4 ... Training model for up to 143.2s of the
143.19s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-17.9906 = Validation score (-mean_absolute_error)
6.46s = Training runtime
0.25s = Validation runtime

Fitting model: CatBoost_BAG_L4 ... Training model for up to 139.86s of the
139.85s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-18.2472 = Validation score (-mean_absolute_error)
11.22s = Training runtime
0.11s = Validation runtime

Fitting model: NeuralNetFastAI_BAG_L4 ... Training model for up to 134.36s of
the 134.34s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-17.9235 = Validation score (-mean_absolute_error)
90.3s = Training runtime
1.2s = Validation runtime

Fitting model: XGBoost_BAG_L4 ... Training model for up to 102.78s of the
102.77s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-17.8802 = Validation score (-mean_absolute_error)
8.5s = Training runtime
0.3s = Validation runtime

Fitting model: NeuralNetTorch_BAG_L4 ... Training model for up to 98.57s of the
98.56s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-17.9254 = Validation score (-mean_absolute_error)
106.78s = Training runtime
1.38s = Validation runtime

Fitting model: LightGBMLarge_BAG_L4 ... Training model for up to 62.43s of the
62.42s of remaining time.

Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy

-17.9937 = Validation score (-mean_absolute_error)
17.81s = Training runtime
0.54s = Validation runtime

```

Completed 3/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L5 ... Training model for up to 360.0s of the
54.95s of remaining time.
    -17.6017      = Validation score    (-mean_absolute_error)
    0.52s        = Training    runtime
    0.0s         = Validation runtime
AutoGluon training complete, total runtime = 1745.61s ... Best model:
"WeightedEnsemble_L3"
TabularPredictor saved. To load, use: predictor =
TabularPredictor.load("AutogluonModels/submission_87_C/")
Evaluation: mean_absolute_error on test data: -32.428775502249124
    Note: Scores are always higher_is_better. This metric score can be
multiplied by -1 to get the metric value.
Evaluations on test data:
{
    "mean_absolute_error": -32.428775502249124,
    "root_mean_squared_error": -66.53687489719019,
    "mean_squared_error": -4427.155721084338,
    "r2": 0.7678834316810559,
    "pearsonr": 0.8923321954787814,
    "median_absolute_error": -1.9803193473815925
}

Evaluation on test data:
-32.428775502249124

```

3 Submit

```

[12]: import pandas as pd
import matplotlib.pyplot as plt

train_data_with_dates = TabularDataset('X_train_raw.csv')
train_data_with_dates["ds"] = pd.to_datetime(train_data_with_dates["ds"])

test_data = TabularDataset('X_test_raw.csv')
test_data["ds"] = pd.to_datetime(test_data["ds"])
#test_data

```

```

Loaded data from: X_train_raw.csv | Columns = 48 / 48 | Rows = 92951 -> 92951
Loaded data from: X_test_raw.csv | Columns = 47 / 47 | Rows = 2160 -> 2160

```

```

[13]: test_ids = TabularDataset('test.csv')
test_ids["time"] = pd.to_datetime(test_ids["time"])
# merge test_data with test_ids
test_data_merged = pd.merge(test_data, test_ids, how="inner", right_on=["time",
↪ "location"], left_on=["ds", "location"])

#test_data_merged

```


Loaded data from: test.csv | Columns = 4 / 4 | Rows = 2160 -> 2160

```
[ ]: # predict, grouped by location
predictions = []
location_map = {
    "A": 0,
    "B": 1,
    "C": 2
}
for loc, group in test_data.groupby('location'):
    i = location_map[loc]
    subset = test_data_merged[test_data_merged["location"] == loc].
    ↪reset_index(drop=True)
    #print(subset)
    pred = predictors[i].predict(subset)
    subset["prediction"] = pred
    predictions.append(subset)

    # get past predictions
    past_pred = predictors[i].
    ↪predict(train_data_with_dates[train_data_with_dates["location"] == loc])
    train_data_with_dates.loc[train_data_with_dates["location"] == loc,
    ↪"prediction"] = past_pred

[ ]: # plot predictions for location A, in addition to train data for A
for loc, idx in location_map.items():
    fig, ax = plt.subplots(figsize=(20, 10))
    # plot train data
    train_data_with_dates[train_data_with_dates["location"]==loc].plot(x='ds',
    ↪y='y', ax=ax, label="train data")

    # plot predictions
    predictions[idx].plot(x='ds', y='prediction', ax=ax, label="predictions")

    # plot past predictions
    train_data_with_dates[train_data_with_dates["location"]==loc].plot(x='ds',
    ↪y='prediction', ax=ax, label="past predictions")

    # title
    ax.set_title(f"Predictions for location {loc}")

[ ]: # concatenate predictions
submissions_df = pd.concat(predictions)
submissions_df = submissions_df[["id", "prediction"]]
submissions_df
```

```
[ ]: # Save the submission DataFrame to submissions folder, create new name based on
      ↪ last submission, format is submission_<last_submission_number + 1>.csv

      # Save the submission
      print(f"Saving submission to submissions/{new_filename}.csv")
      submissions_df.to_csv(os.path.join('submissions', f"{new_filename}.csv"),
        ↪ index=False)
      print("jall1a")
```

```
[ ]: # save this running notebook
      from IPython.display import display, Javascript
      import time

      # hei123

      display(Javascript("IPython.notebook.save_checkpoint();"))

      time.sleep(3)
```

```
[ ]: # save this notebook to submissions folder
      import subprocess
      import os
      subprocess.run(["jupyter", "nbconvert", "--to", "pdf", "--output", os.path.
        ↪ join('notebook_pdfs', f"{new_filename}.pdf"), "autogluon_each_location.
        ↪ ipynb"])
```

```
[ ]: # feature importance
      location="A"
      split_time = pd.Timestamp("2022-10-28 22:00:00")
      estimated = train_data_with_dates[train_data_with_dates["ds"] >= split_time]
      estimated = estimated[estimated["location"] == location]
      predictors[0].feature_importance(feature_stage="original", data=estimated,
        ↪ time_limit=60*10)
```

```
[ ]: # feature importance
      observed = train_data_with_dates[train_data_with_dates["ds"] < split_time]
      observed = observed[observed["location"] == location]
      predictors[0].feature_importance(feature_stage="original", data=observed,
        ↪ time_limit=60*10)
```

```
[ ]: display(Javascript("IPython.notebook.save_checkpoint();"))
      time.sleep(3)

      subprocess.run(["jupyter", "nbconvert", "--to", "pdf", "--output", os.path.
        ↪ join('notebook_pdfs', f"{new_filename}_with_feature_importance.pdf"),
        ↪ "autogluon_each_location.ipynb"])
```

```
[ ]: # import subprocess

# def execute_git_command(directory, command):
#     """Execute a Git command in the specified directory."""
#     try:
#         result = subprocess.check_output(['git', '-C', directory] + command,
#     ↪ stderr=subprocess.STDOUT)
#         return result.decode('utf-8').strip(), True
#     except subprocess.CalledProcessError as e:
#         print(f"Git command failed with message: {e.output.decode('utf-8').
#     ↪ strip()}")
#         return e.output.decode('utf-8').strip(), False

# git_repo_path = "."

# execute_git_command(git_repo_path, ['config', 'user.email',
#     ↪ 'henrikskog01@gmail.com'])
# execute_git_command(git_repo_path, ['config', 'user.name', 'hello if hello is
#     ↪ not None else 'Henrik eller Jørgen'])

# branch_name = new_filename

# # add datetime to branch name
# branch_name += f"_{pd.Timestamp.now().strftime('%Y-%m-%d_%H-%M-%S')}"

# commit_msg = "run result"

# execute_git_command(git_repo_path, ['checkout', '-b', branch_name])

# # Navigate to your repo and commit changes
# execute_git_command(git_repo_path, ['add', '.'])
# execute_git_command(git_repo_path, ['commit', '-m', commit_msg])

# # Push to remote
# output, success = execute_git_command(git_repo_path, ['push',
#     ↪ 'origin', branch_name])

# # If the push fails, try setting an upstream branch and push again
# if not success and 'upstream' in output:
#     print("Attempting to set upstream and push again...")
#     execute_git_command(git_repo_path, ['push', '--set-upstream',
#     ↪ 'origin', branch_name])
#     execute_git_command(git_repo_path, ['push', 'origin', 'henrik_branch'])

# execute_git_command(git_repo_path, ['checkout', 'main'])
```